

TOP TEN

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Category: Waterborne

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Research Area 4: Efficient & Resilient Systems

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A Novel Decision Support Platform for Selecting Optimal Decarbonization Strategies for Individual Ships: Integrating Life Cycle Cost and Sustainability Assessment

The maritime sector is pushing to decarbonise and lower its environmental impact. Earlier studies show that the global warming reduction potential and cost associated with different decarbonisation pathways vary with the vessel. Hence, the shipowners and shipyards must weigh environmental performance and financial considerations when deciding on a decarbonisation strategy. In this context, a system-level analysis that considers the operational, functional, and technical characteristics of the vessel is required. Each transition pathway involves modifications to the energy supply chain and propulsion system, and doing such assessment is time and resource intensive. Moreover, both cost and environmental assessment must be integrated to ensure the same system boundary and scope to identify potential environmental burdens or costs with greater clarity.

This research introduces a novel platform comprising an integrated life cycle tool that allows cost and environmental impact assessment for each vessel for selected decarbonisation pathways. This platform aims to enable ship owners and operators to make system-based decisions on choosing the decarbonisation strategy for individual ships. The tools calculate the life cycle greenhouse gas emissions, other environmental impacts, and the cost of different pathways based on the vessel's operational, functional, and technical profile. The platform covers pathways based on e-fuels based on hydrogen, blue fuels based on blue hydrogen, and direct electrification. The platform output includes the calculation of carbon abatement costs and other environmental benefits, allowing relative comparison between these pathways and the fossil-based pathways. This enables stakeholders to make an informed decision based on the effect of different future environmental regulations.

